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THE ZOOLOGICAL STATION IN NAPLES

THERE are few of those interested in biological studies who are not more or less familiar with the history and character of the great international laboratory on the shore of the Bay of Naples, which has had so profound an influence on the progress of zoology in the last nine years; scarcely a volume belonging to recent zoological literature, British or foreign, can be taken up, but the acknowledgment of indebtedness to the resources of the Naples station comes under the eye; the publications of the station are on the shelves of most scientific libraries; and many accounts of its organisation have appeared from time to time in scientific periodicals and even in the daily press. But the institution is much too interesting a topic of discussion to be easily exhausted; it is constantly developing and exhibiting new stages of existence. There is soon to be added a new department that of comparative physiology, the work of which will be carried on in a separate laboratory; and on the eve of an expansion so considerable, it is natural to reflect on the work the station has already accomplished, its present state of activity, and the probabilities of its future.

In no branch of zoological science has such rapid and important progress been made in recent years as in embryology, and the investigations into the development of marine forms of all classes by which this progress has been chiefly effected, have been in great part the result of the special facilities which the resources of the Naples station offer for this kind of research. The brilliant career of the lamented Francis Balfour was begun while he occupied, on the opening of the station in 1874, the table rented by Cambridge University. His stay on this occasion lasted from February to June, and resulted in the publication of his first paper, "On the Development of Elasmobranchs," in the *Quarterly Journal of Microscopical Science*. The material for the researches which he continued to carry on at Cambridge on his return was sent from the station. In 1875 he again spent some months at Naples, and again published the results of his work in the same *Quarterly Journal*, this time under the title "A Comparison of the Early Stages in the Development of Vertebrates." The following year he did not visit the station, but in 1877 he investigated there the spinal nerves of Amphioxus, and added to his work on Elasmobranchian embryology. These studies appeared in the *Journal of Anatomy and Physiology*, vols. x. and xi. In the preface to his "Monograph on the Development of Elasmobranchs," which, published in 1878, was at once recognised by all biologists as a classical work, Balfour gratefully acknowledges how much his researches owed to the resources of the zoological station and the support of its *personnel*. It is unnecessary to dilate here on the importance of Balfour's work; the significance of the discoveries which he made, such as the openings of the renal organs into the body cavity in Selachians as in Annelids, the epiblastic origin of the sympathetic system, the history of the blastopore in vertebrates, and its relation to the medullary canal, the head cavities, &c., and the masterly way in which he applied the results of his observations to the solution of the great problems of vertebrate morphology, have given him a place among those whose names mark epochs in the progress of science.

Another English name connected with work in the field of vertebrate embryology which does honour to the Naples station is that of Mr. Milnes Marshall, who has more than once occupied the British Association table. Much of our knowledge of the development of Salpa, the excentric relation of the vertebrates, is due to the work in the station of Professors Salensky and Todaro.

Molluscan embryology has benefited by the existence of the station through the work of Prof. Lankester and the Russian embryologist, Dr. Bobretzky. The former carried on researches in the laboratory in the spring of 1874, and obtained many of the important results which are embodied in his memoir "On the Development of Cephalopoda" (*Quart. Journ. Mic. Sci.* vol. xv.), and his paper "On the Development of Mollusca" (*Phil. Trans.* 1875). Dr. Bobretzky of Kiev occupied the Russian table in 1874, and applied the methods of technical histology to the study of the ova of various Gasteropods, Nassa, Fusus, &c., and of Loligo and other Cephalopods. His Russian memoir on the latter (Moscow, 1877) contains the most complete and reliable series of figures we have of the anatomy of Cephalopod embryos.

In the embryology of sponges, Prof. Oscar Schmidt of Strassburg has published the results of important researches carried on in the station in the years 1875 and 1877. Prof. Selenka of Erlangen worked out the development of various Holothuria at the Bavarian table in 1875, and of Echinidæ in 1879. The work of Dr. Carpenter on the development of Antedon (*Proc. Roy. Soc.* 1876) was done at the British Association table, and the contributions of Dr. Goette to the same subject are based on studies made in the station in 1875. One of the best known of recent studies in development which have proceeded from the station is that of Dr. Spengel, on Bonellia, published in 1879.

Leaving works of a strictly embryological character, we will mention some of the principal contributions to general morphology, which have taken their origin in the station. Prof. Grenacher's great work on the eyes of Arthropods, which forms one of the chief recent additions to our knowledge of the class, is based on researches begun at the Mecklenburg table in 1876. Dr. Hubrecht's researches on Nemertines were carried out at the Dutch table. The contributions to and confusions of Molluscan morphology, which we owe to Von Jhering, proceeded from work done in the station, and both are not without value in the progress towards truth. Dr. Spengel's important paper on the "Geruchsorgan der Mollusken" (*Zeitschr. f. wiss. Zool. Bot.* xxxv.), was produced while he was a member of the staff of the institution. The remarkable volume of the brothers Hertwig, "Die Actinien," describing a nervous system still existing in the primitive condition, was the result of an occupation of two of the German tables.

The honour of the discovery of Symbiosis in animals is shared by two zoologists, who both carried out their researches in the station, Mr. Geddes and Dr. Brandt; and the studies which the latter is still carrying on there have resulted in many other contributions to our knowledge of the Radiolarians.

X

The investigations of Von Koch into the relations of the skeleton in corals, Flemming's researches on the ova of Echinoderms, Metschnikoff's on Orthonectidæ, those of Dr. Vigelius on the anatomy of Cephalopoda, of Prof. Greef on Alciopidæ, are a few more examples of good work, of which some of the credit belongs to the station. Since the laboratory was opened more than 200 scientific workers have studied at its tables.

Besides this success which the institution has obtained as an international laboratory, it has also produced great results by its own individual activity. A vast amount of complete and careful work is devoted to the preparation of the series of monographs which commenced with the Ctenophoræ of Dr. Chun in 1880. Of these six have appeared—four zoological and two botanical—and a large number, embracing many important classes of animals, are far advanced towards completion. The Planarians, by Dr. Lang, will be received with interest on account of the discoveries and original views which his work has already produced. The Actiniæ are being worked out thoroughly, for the first time, by Dr. Andres. The Sponges, the Radiolarians, the Copepoda, and the Capitellidæ are also at present undergoing a complete study in the station, and two of the volumes already announced will treat of families of Algæ. An enterprise of such magnitude has never before been undertaken in the field of zoological investigation; only an organisation of the power and resources of the station at Naples could attempt it; an organisation which is able to offer to zoologists, of energy and zeal, unlimited material in the living condition, unlimited leisure for work, and immunity from all distractions save some slight duties connected with the routine of the laboratory.

The other two publications of the station are of a less colossal character. The *Mittheilungen* was begun in 1879, for the sake of publishing the numerous discoveries and new views which result from the work of the staff occupied with the "Fauna and Flora," or from the researches of those occupying the rented tables. The circulation has already reached 400 copies, and the few volumes which have appeared constitute a valuable addition to the literature of biology. In its pages are described the new processes in the *technique* of microscopical work which have been invented in the station, one of which, the method of preparing series of sections, devised by Dr. Giestrecht, and now used in every laboratory in Europe, is an improvement whose importance it is impossible to estimate too highly.

The object of the *Zoologischer Jahresbericht* was to supply a bibliographical report, which should not only give a list of published works but a *résumé* of the matter contained in each, and which should give perfect facilities for reference. The latter object is attained by means of two indices—one of the names of authors, the other of subjects. The English *Zoological Record* and the report of the *Archiv für Naturgeschichte* are devoted chiefly to systematic zoology; in the *Jahresbericht* every publication on anatomy, embryology, morphology, or physiology, is catalogued and summarised.

In contrast with the activity exhibited by the station in the directions which we have hitherto considered, activity whose results are as conspicuous as they are important, is the unobtrusive work of the department presided over by the energetic conservator, Salvatore Lo Bianco,—the department for the preservation and distribution of marine animals. All the material procured by the expeditions of the two steam launches, and the smaller boats belonging to the station, or by purchase from Neapolitan fishermen, passes first into the control of this department. Whatever is needed by the various occupants of the work-tables and by the scientific staff is selected and allotted according to applications made from day to day. The rest is either put into the tanks of the public aquarium, or preserved. Marvellous progress has been made in the art of preserving delicate and sensitive creatures in their naturally extended condition, and inland laboratories can be provided with specimens of Alcyonaria, Zoantharia, Medusæ, Ctenophora, Annelids, &c., which show the form if not the colour of the living animal, and in which all the organs are in a perfect condition for anatomical and generally even histological study.

There is scarcely a biological laboratory in Europe which has not had recourse to the preparing department of the Naples station in order to procure material for investigation or for teaching purposes. An example of the work of the department is to be exhibited in the approaching International Fisheries Exhibition—a most beautiful collection of preparations is now in the station, ready to be sent to London.

In connection with this department arrangements have been made with the naval authorities of Germany and Italy, by means of which an officer is sent from time to time to the station to learn the methods of obtaining and treating marine creatures for the purpose of scientific study; so that the cruises of war-ships in remote seas may contribute to valuable scientific results when each has an officer on board who understands what is of zoological interest and how it should be preserved.

In conclusion it will be of interest to give a few details concerning the finances and arrangements of the station. The annual income is between 5000*l.* and 6000*l.*, of which 1200*l.* is derived from the public aquarium, 1600*l.* from the rented tables, about 800*l.* from the sale of the publications, including 260 annual subscriptions of 50*s.* each for the monographs, 600*l.* from the preparation department, and 1500*l.* is the amount of the German Government subsidy.

The total number of those in the permanent service of the station is thirty-seven, of which eight comprise the scientific staff, and the rest are made up by the engineers under the direction of Mr. Petersen, the fishermen, and the conservator and his assistants. The number of tables at present rented is twenty-one, but the station has space for thirty. At the beginning only seven tables were taken, two each by Prussia, England, and Italy, and one by Holland. The School of Biology at Cambridge has derived much support and benefit from its connection with the station, and the taking of a table by Oxford would probably give to zoological studies there an impetus which is much needed. Of the few zoologists which Oxford produces, some have already had recourse to the British Association table. It is probable that some one of the many rich institutions in America will soon take a table for the use of American zoologists, many of whom, imperfectly acquainted with the organisation of the station, and therefore unaware that no table can be occupied unless taken either by a corporation or a private indi-

vidual for a whole year, have applied for permission to work there. Last year Mr. Whitman, whose observations on the development of Clepsine are well known, received this permission under special circumstances by the courtesy of the staff, and carried out some excellent researches on Dicæmidæ, which are published in the last number of the *Mittheilungen*. Recently an increased number of similar applications have been received from American zoologists.

In speaking of the arrangements of the station, the perfection of the organisation for the supply of material, by means of the dredging and fishing of the gulf, cannot be too warmly praised or admired. Except in continuously bad weather, the beautiful and wonderful creatures comprising the rich Mediterranean fauna are brought in to the station in an abundance that is perfectly bewildering to a zoologist on his first visit. The possession of two steam launches, the larger of which, the *Johannes Müller*, was given by the Berlin Academy in 1877, while the smaller was purchased subsequently, gives to the fishing department the facilities for rapid locomotion and transport, without which such abundance and perfect condition of the living material could not be obtained; especially as some of the most fruitful localities are widely separated, and a great many of the creatures, including all pelagic forms, are of extreme sensitiveness and delicacy.

The zoological station, although only nine years have passed since its first opening, has become a necessity for the progress of zoology; its international character enables every country to contribute to its support and share in the benefits derived from it; it is a great organisation by which forces of various kinds are brought together to aid in the attainment of one great object, the investigation of the facts and phenomena of marine life in all its diversities, and their explanation in accordance with the principles of evolution. The progress which is brought about by the work actually done in the station is not more important than the indirect influence it exerts in various ways; its example has produced similar enterprises in various parts of the world; the benefit of the experience it gains extends to other centres of scientific research, and other branches of biology than marine zoology, and by its own vitality and its influence on the zoologists who study at its tables it has done much to sustain and develop the great impulse which the genius of Darwin gave to zoology twenty-three years ago. J. T. CUNNINGHAM

EPPING FOREST

THE House of Commons divided last Monday afternoon upon the Chingford and High Beech Railway Bill. An amendment was proposed by Mr. Bryce, Chairman of the Commons Preservation Society, and was supported by Mr. Thorold Rogers, Sir H. J. Selwin-Ibbetson, who framed the Epping Forest Act of 1878, Mr. Fowler, Mr. Firth, Mr. T. C. Baring, Lord Eustace Cecil, Mr. Ritchie, Mr. James, Mr. Caine, and Mr. Waddy. As a fitting sequel to Mr. Meldola's paper, which we published last week, the result of the division, which was announced amidst cheers, was: For the second reading, 82; against it, 230; majority against the Bill, 148. It is to be hoped that this will be the last attempt to tamper with what Mr. Bryce justly described as "a priceless heritage of the people of London."

It is inevitable from the growth of our great towns that the student of Nature dwelling in their midst must go farther and farther afield for the objects of his study. It seems, moreover, that our science is at present inadequate to prevent the lethal influence of smoke and acrid fumes from dealing destruction to vegetation over a wide region outside the actual boundaries of these towns. The sanitary necessity of open spaces has been amply demonstrated; but it was not as a mere open space or people's park that Parliament allowed the Corporation of London to acquire Epping Forest in 1878.

The so-called rights of those who had inclosed the Forest, were overridden in order that an expanse of natural and, in some senses, primeval forest might be secured for the benefit of all classes of the public free from encroachment for ever. Parliament directed that it was to be preserved "in its natural condition as a forest," and conferred upon a Committee—composed of some members of that Corporation which holds the manorial rights, together with four resident gentlemen as Verderers, elected nominally by the commoners—the position of Conservators.

Unfortunately Common Councilmen seem to share the popular ignorance as to what constitutes the natural aspect of a forest. Many people believe a forest to be a large wood or plantation, and the Conservators seem to have been mainly actuated by fears lest visitors should get their feet wet or find the Forest less amusing than other suburban resorts. Draining and roadmaking have been their main tasks with a view to maintain the natural aspect the Forest wore for centuries, while during the five years they have been in office no attempt has been made at reafforesting the now unsightly fallows that the intruders had reduced into an arable condition. Pieces of artificial water have been constructed, mostly with outlines reminding one of the so-called Round Pond in Kensington Gardens; pleasure-boats have been licensed upon them at a rental estimated at over 200*l.* per annum; free displays of fireworks in connection with a huge tavern, shooting-galleries, and steam-roundabouts have been authorised as contributing to a truly ideal forest.

These steps have of course been taken with the idea that the Conservators had the power to act in the way they think best calculated to elevate and refine the working-classes; but they are diametrically opposed to the spirit of the Act of 1878, which did not aim at establishing a tea-garden or at pandering to the lowest tastes of any class of the community.

As is seen from Mr. Meldola's article, the Essex Field Club and other scientific societies have more than once protested against such mismanagement; but the Conservators had not yet filled up the full measure of their iniquities. They must promote a railway, if not a tramway as well.

English public opinion is beginning to awaken to the idea that we have now almost as many railways as are required for any purposes but providing fees for directors and engineers and feeding the jealousies of rival companies. In the present session of Parliament the railway companies have evinced in the Bills they are promoting a partiality for common land that would be remarkable were not the reason for it sufficiently obvious. Common land can be had cheap; for it is everybody's business to